L SE | ETRX | IV CBGS 16/5/12 AE maths

mk.H.1stHlf12.1

Con. 3578-12. GN-5525

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt **any four** from remaining **six** questions.
(3) **Figures** to the **right** indicate the **full** marks.

1. (a) Let X be a contineous random variable with probability distribution — 5

$$P(X) = \frac{x}{6} + K, \quad 0 \le x \le 3$$
$$= 0, \quad \text{otherwise}$$

Find K and $P(1 \le X \le 3)$.

(b) A relation R is the set of integers is defined by xRy if and only if $x < y + 1$. 5
Examine wheather R is —
(i) reflexive
(ii) symmetric
(iii) transitive.

(c) Find the eigen values and eigen vectors corresponding to the following matrix — 5

$$\begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}.$$

(d) Find Laurent's series for — 5

$$f(z) = (z-3)\,\text{Sin}\left(\frac{1}{z+2}\right) \quad \text{about} \quad z = -2.$$

2. (a) Seven dice are thrown 729 times. How many times do you expect at least four dice to show three or five ? 7

(b) Evaluate $\int_0^{2\pi} \frac{\text{Cos } 2\theta}{(5 + 4\,\text{Cos}\,\theta)}\,d\theta$. 7

(c) Show that the set of matrices $m = \begin{bmatrix} a & b \\ -5b & a \end{bmatrix}$, $a, b \in z$ form an integral domain. 6
Is it a field ?

3. (a) Evaluate $\oint_C \tan z\,dz$ where C 7
(i) is the circle $|z| = 2$
(ii) is the circle $|z| = 1$.

(b) Is the following function injective, surjective ? 7
$f : R \to R$, $f(x) = 2x^2 + 5x - 3$.

(c) Fit a Binomial distribution to the following data :— 6

X :	0	1	2	3	4
Frequency :	12	66	109	59	10

4. (a) If X is a normal variate with mean 10 and standard deviation 4, find — 7

(i) $P(|X-14|<1)$

(ii) $P(5 \leq X \leq 18)$

(iii) $P(X \leq 12)$.

(b) Let (G, $*$) be a group. Prove that G is an Abelian group if and only if $(a * b)^2 = a^2 * b^2$. 7
where a^2 stands for $a * a$.

[TURN OVER

(c) Using Poisson distribution find the approximate value of 6

$$^{300}C_2\,(0\cdot02)^2\,(0\cdot98)^{298} + {}^{300}C_3\,(0\cdot02)^3\,(0\cdot98)^{297}.$$

5. (a) Show that the matrix $A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$ is similar to a diagonal matrix. Also find the transforming matrix and the diagonal matrix. 7

(b) A die was thrown 132 times and the following frequencies were observed : 7

No. obtained :	1	2	3	4	5	6	Total
Frequency :	15	20	25	15	29	28	132

Test the hypothesis that the die is unbiased.

(c) If C is the circle $|z| = 1$, using the integral $\oint_C \frac{e^{kz}}{z}\,dz$, where K is real, 6

show that $\int_0^{\pi} e^{k\cos\theta}\cos(k\sin\theta)\,d\theta = \pi$.

6. (a) Let $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and R be the relation 'is divisible by'. Obtain the relation matrix and draw the Hasse diagram. 7

(b) A certain injection administered to 12 patients resulted in the following changes of blood pressure, 7

5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4.

Can it be concluded that the injection will be in general accompained by an increase in blood pressure ?

(c) If X_1 has mean 5 and variance 5, X_2 has mean –2 and variance 3. If X_1 and X_2 are independent random variables, find — 6

(i) $E(X_1 + X_2)$, $V(X_1 + X_2)$

(ii) $E(2X_1 + 3X_2 - 5)$, $V(2X_1 + 3X_2 - 5)$.

7. (a) A random variable X has the following probability distribution :— 7

X :	–2	3	1
P(X = x) :	1/3	1/2	1/6

Find (i) Moment generating function
(ii) First two raw moments
(iii) First two central moments.

(b) Verify Cayley-Hamilton theorem for the matrix A and hence find A^{-1} where 7

$$A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}.$$

(c) A random sample of 50 items gives the mean 6·2 and standard deviation 10·24. Can it be regarded as drawn from a normal population with mean 5·4 at 5% level of significance ? 6

SE | ETRX | IV (Rev.) 21 | 5 | 2012

Digital System Design - II

PH March Exam (4) 129

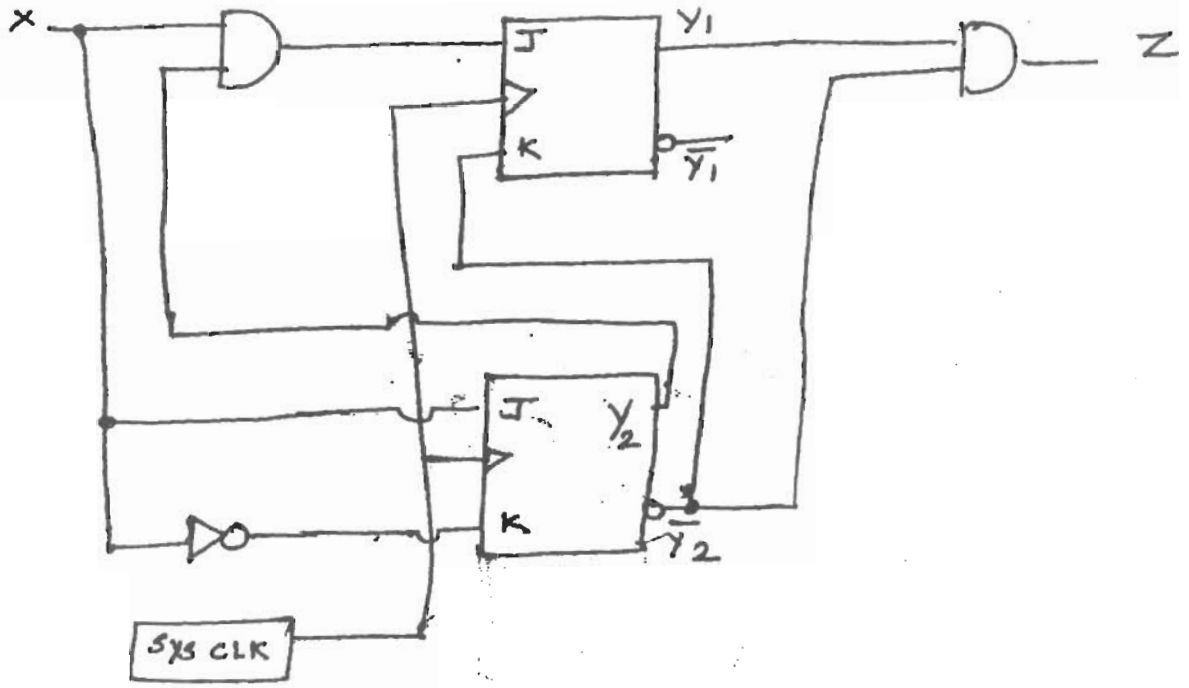
Con. 3790-12.

GN-5519

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.
(3) **Figures** to the **right** indicates **full** marks.
(4) Assumptions made must be **clearly** stated.

1. (a) 10



Analyze the sequential M/c and draw the state diagram.

(b) Write V.H.D.L. code for full adder using half adder as component. 10

2. (a) Write behavioural description code of simple 11 bit floating point encoder. 10
(b) Write a V.H.D.L. code for multiplexer IC 74151. 10

3. (a) Reduce the state table using implication chart method and design state machine using D F/F and decoder. 10

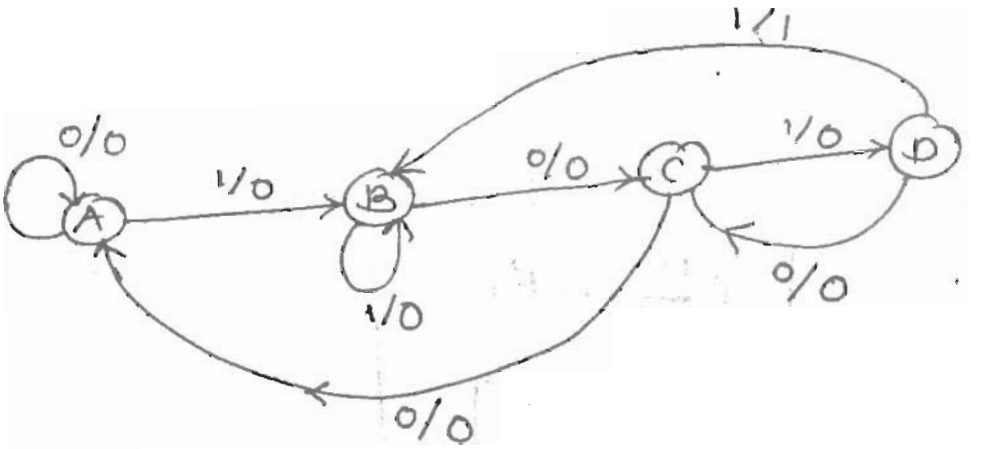
Present state	Next state		O/P (z)	
	x = 0	x = 1	x = 0	x = 1
S_0	S_4	S_3	0	1
S_1	S_5	S_3	0	0
S_2	S_4	S_1	0	1
S_3	S_5	S_1	0	0
S_4	S_2	S_5	0	1
S_5	S_1	S_2	0	0

(b) Design MOD 16 counter using IC 74169 and SSI package using following counting sequence. . . . . 7, 6, 5, 4, 3, 2, 1, 0, 8, 9, 10, 11, 12, 13, 14, 15, 7, 6, ... 10

[TURN OVER

4. (a) Design a Moore sequential machine that detects serial I/P of 010110. Use suitable F/F's and logic for designing. 10

(b) Describe a State Machine shown below in V.H.D.L. 10



5. (a) Design a coin operated vending machine that dispenses Candy under the following conditions– 10

(i) The machine accepts ₹ 5 and ₹ 10 coins.

(ii) It takes ₹ 15 for one piece of candy to be released from the machine.

(iii) If ₹ 20 is deposited the machine will credit the buyer with ₹ 5 and wait for the buyer to make second purchase.

Design using Mealy Machine.

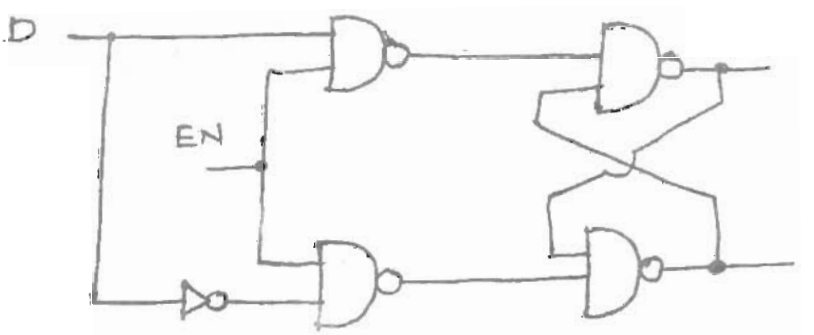
(b) Design MOD 193 counter with the counting sequence . . . . . 63, 64, 65, ... , 254, 255, 63, 64, ... use IC 74163. 10

6. (a) Draw and explain Logic diagram of 64 × 1 diode ROM. Use 2-dimensional decoding. 10

(b) Write V.H.D.L. code for JK F/F. Use Asynchronous preset and synchronous clear. 10

7. (a) Explain the working of CPLD XC 9500 in detail. 10

(b) Analyze the pulse mode asynchronous sequential machine and obtain the state diagram. 10



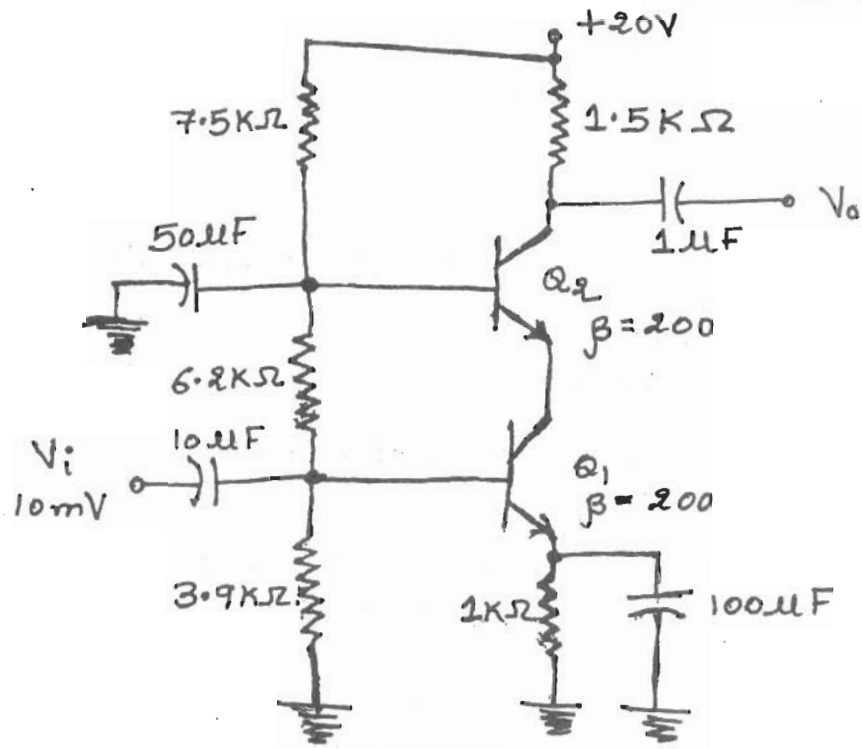
V SE / ETRX / IV (Rev) 25/5/2012
Electronic Circuit Analysis & Design

Con. 4022-12. **GN-5532**

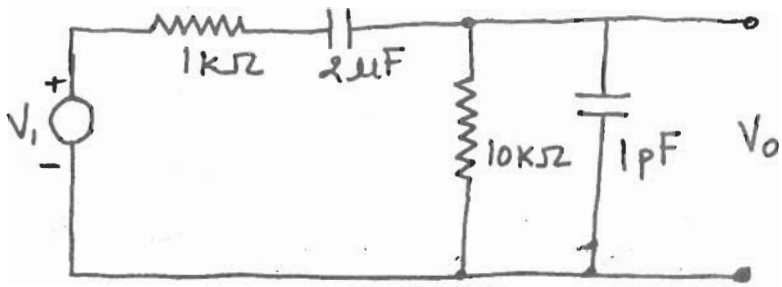
(3 Hours) **[Total Marks : 100**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from Question Nos. **2** to **7.**
(3) Assume **suitable** data wherever **necessary** with proper **justification.**
(4) **Figures** to the **right** indicates **full** marks.

1. Attempt any **four** of the following :— **20**
   (a) Explain differential amplifier with active load.
   (b) What is cross over distortion in class B power amplifier explaining with waveform ?
   (c) State advantages of negative feedback on performance of amplifier.
   (d) For the circuit given below calculate dc bias voltages V_{B1}, V_{B2} and V_{C2}.



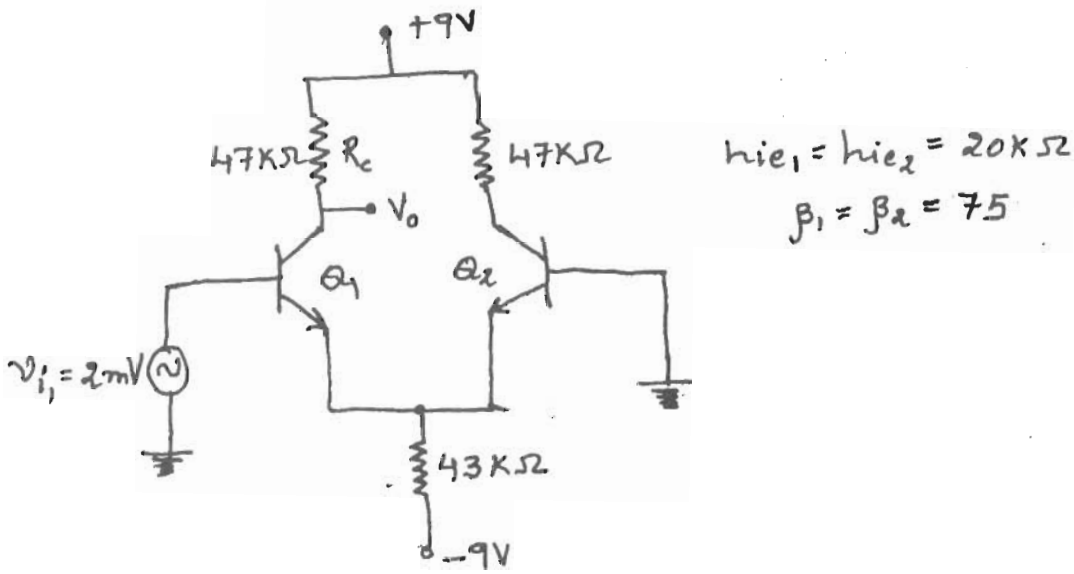
   (e) For the circuit given below determine the 3dB frequencies and bandwidth.



2. Design a two stage RC coupled amplifier for following requirements : F_L better than 15 Hz, Av ≥ 1500, S_{Ic} < 8, R_i ≥ 1MΩ, V_{CC} = 6V. **20**

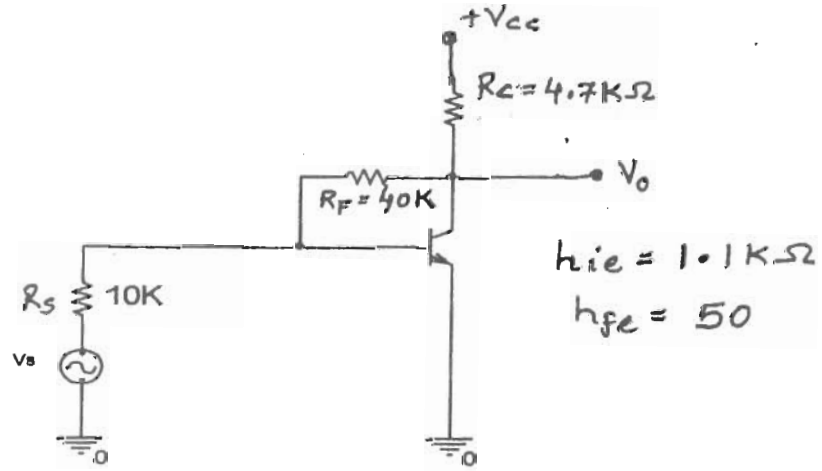
[TURN OVER

3. (a) Explain Class B Push Pull amplifier & derive the expression for maximum efficiency. 10
   (b) For the given differential amplifier determine dc voltages, currents and single ended output voltage V_{01}. 10

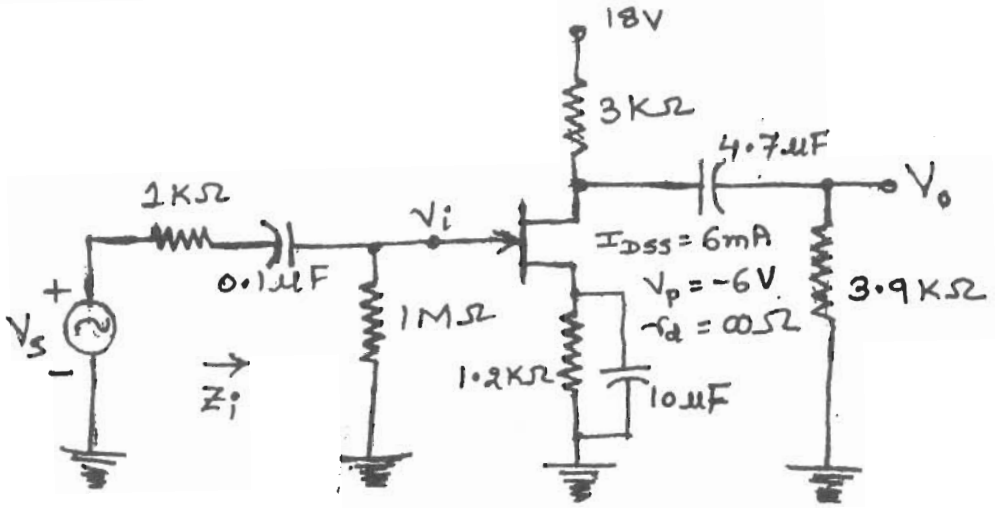


4. (a) For a class B amplifier with V_{CC} = 20 V driving an 16 Ω load, Determine :— 10
   (i) Maximum input power,
   (ii) Maximum output power,
   (iii) Maximum circuit efficiency,
   (iv) Transistor dissipation.
   (b) Explain the high frequency analysis of a BJT amplifier. Derive necessary expressions. 10

5. (a) Draw the circuit diagram of Wein bridge oscillator and explain its working. Derive the necessary equation for frequency of oscillations and for sustaining oscillations. 10
   (b) For the following circuit determine A, β, A_f, Z_{if}, Z_{of} and A_{vf}. 10



6. (a) Determine the lower cutoff frequency for the following network. 10



(b) For a current series negative feedback amplifier derive the expression for the input and output resistances with feedback and comment on the result. 10

7. Write short note on any three :— 20

(a) Heat Sink and its design steps
(b) CMRR improvement in differential amplifier
(c) Nyquist stability criterion
(d) Crystal Oscillator.

———S———

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{EBO} volts d.c.	T_j max. °C	D.C. current gain min	typ.	max.	Small Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	100	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	100	25	75	125	1.5	3.5	0.4
ECN 149	30.0	4.0	1.0	50	40	–	–	8	150	30	50	110	33	60	115	1.2	4.0	0.3
ECN 100	5.0	0.7	0.6	70	60	65	–	6	200	50	90	280	50	90	280	0.9	35	0.05
BC 147A	0.25	0.1	0.25	50	45	50	–	6	125	115	180	220	125	220	260	0.9	–	–
2N 525 (PNP)	0.225	0.5	0.25	85	30	–	–	–	100	35	–	65	–	45	–	–	–	–
BC 147 B	0.25	0.1	0.25	50	45	50	–	6	125	200	290	450	240	330	500	0.9	–	–

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{ja}
BC 147 A	2.7kΩ	18μmho	1.5×10^{-4}	0.4°C/mW
2N 525 (PNP)	1.4kΩ	25μmho	3.2×10^{-4}	—
BC 147B	4.5kΩ	30μmho	2×10^{-4}	0.4°C/mW
ECN 100	50Ω	–	—	—
ECN 149	15Ω	–	—	—
ECN 055	12Ω	–	—	—
2N 3055	6 Ω	–	—	—

BFW 11-JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ volts	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
I_{DS} max. mA	10	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5	0.0
I_{DS} typ. mA	7.0	6.0	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
I_{DS} min.mA	4.0	3.0	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N-Channel JFET

Type	$V_{DS\ max.}$ Volts	$V_{DG\ max.}$ Volts	$V_{GS\ max.}$ Volts	$P_{d\ max.}$ @ 25°C	$T_{J\ max.}$	I_{DSS}	g_{mo} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	50 KΩ	—	0.59°C/mW

S.E. Sem - IV (Rev) – Electronics 30/5/12
Basics of analog & digital Communication Systems

Con.4484-12

GN-8429

(3 Hours) [Total Marks 100

N. B. (1) Question No. 1 is compulsory.
(2) Answer any four out of remaining six questions.
(3) Assumptions made should be clearly stated.
(4) Answer to each new question to be started on a fresh page.

Q. 1) Answer the following: - (20)

A) A 400 watts carrier is modulated to a depth of 75%. Find the total power in the amplitude modulated wave. Assume the modulating signal to be a sinusoidal one.

B) The bit sequence 1011101011 is to be transmitted using following formats.
i) Unipolar RZ
ii) Unipolar NRZ
iii) Bipolar RZ
iv) Bipolar NRZ
v) Split-Phase Manchester

Draw all the waveforms.

C) Describe the significance of the FM noise triangle.

D) Explain in brief the frequency-division multiplexing.

Q. 2. A) Define the following propagation terms: - (10)
i) Critical Frequency & Critical Angle
ii) Virtual Height
iii) MUF
iv) Skip Distance & Skip Zone
v) Free-Space Path Loss

B) A receiver connected to an antenna whose resistance is 50 Ω has an equivalent noise resistance of 30 Ω. Calculate the receiver's noise figure in decibels & its equivalent noise temperature. (5)

C) Explain the difference between correlated and uncorrelated noise. (5)

Q. 3. A) Draw & explain the block diagram of an ISB transmitter. (10)

B) Draw & explain the "Third method" of SSB generation. That uses the balanced modulator to suppress the carrier. (10)

[TURN OVER

Q. 4. A) If the signal $V(t) = 20\sin(6.28*10^6t + 10\sin 6.283*10^3t)$ represents a phase-modulated signal, determine. (5)

i) The carrier frequency
ii) The modulating frequency
iii) The modulation index
iv) The peak phase deviation

B) Describe the difference between FM & AM receiver, bearing in mind the different frequency ranges & bandwidths over which they operate. (5)

C) Explain the operation of the balanced slope detector, using a circuit diagram & response characteristics. (10)

Q. 5. A) Draw the block diagram for an AM superhetrodyne receiver & describe its operation & the primary function of each stage. (10)

B) Describe the important parameters of radio receiver. (10)

Q. 6. A) State & prove sampling theorem in time domain. (10)

B) For a pulse-amplitude modulated transmission of voice signal having maximum frequency equal to fm = 3 kHz, calculate the transmission bandwidth. It is given that the sampling frequency fs = 8 kHz & the pulse duration $\tau = 0.1$ Ts (10)

Q. 7. A) What is the slope overload distortion & granular noise in delta modulation? How it is removed in ADM. (10)

B) With the help of neat diagram. Explain the transmitter & receiver of pulse code modulation. (10)

Sem IV (Rev) Electronics 8/May 2012

Sub:- E & EM I & M

ws May-2012 44

Con. 4839-12. GN-9602

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory** and solve any **four** questions out of remaining **six**.
(2) Assume **suitable** data if **necessary** and mention that assumption while solving that question.
(3) **Figures to the right** indicate **full** marks.

1. Any **four** :– 20
   (a) A PMMC instrument has FSD of 100 μA coil resistance is 1 KΩ. Calculate the required shunt resistance value to convert the instrument in to an ammeter with (i) FSD = 100 mA (ii) FSD = 1A.
   (b) What is the difference between electrical instruments and electronic instruments ?
   (c) Explain basic principle of frequency meter.
   (d) When oscilloscope time base is disconnected and various types of signals are connected to vertical and horizontal inputs then draw displays.

	Vertical I/P	Horizontal I/P
i	Sine Wave	OV
ii	Sine Wave	Sine wave..... same 'f' 0° phase
iii	Sine Wave	antiphase sine wave"
iv	Sine Wave	Sine wave with 90° phase. same frequency.

   (e) What is Meggar ? Explain its working.

2. (a) What is ohmmeter ? Explain working principle of series and shunt ohmmeter. Also compare them. Comment on calibration of ohmmeter. 10
   (b) What is resolution and sensitivity of digital voltmeter ? Explain working principle with block diagram of successive approximation type DVM. 10

3. (a) Explain with the block diagram basic elements of a laboratory type function generator. Which is the basic function generated ? How ? How frequency is controlled ? How sine function is generated ? 10
   (b) Explain with the block diagram basic elements of digital phase meter. How the meter tells about which waveform is leading or lagging ? Mention limitations of this type of meter. 10

4. (a) What is the need of time base generator in standard CRO ? How the time base signal is generated ? What is delay line ? Why it is needed ? Why some times the triangular wave observed in CRO moves left or right continuously ? How to stabilise it ? What actually happens when we get steady waveform on CRO ? 10
   (b) What is z-modulation in CRO ? For what purpose it is used ? Can frequency and phase difference be measured using z-modulation ? 10

[TURN OVER

5. (a) What is Q meter ? Explain its working principle with the help of circuit diagram. **10**
   (b) What are the two types of connections for measuring resistance using voltmeter, ammeter method ? Compare the two methods. **10**
   If voltmeter is connected across supply type connection the measured current is 0·5 A and voltmeter indication is 500 V. Ammeter has a resistance $R_a = 10\ \Omega$. Calculate the value of 'R'.

6. (a) With reference to the characteristics and applications, differentiate between D.C. shunt and series motors. **10**
   (b) Explain the principle of operation of PMMC and moving Iron type of instruments. Compare the two basic types. **10**

7. (a) What are the various torques required in PMMC ? How they are generated ? What is the requirement of each of the torque ? **10**
   (b) **Draw only** the Kelvin's double bridge. **6**
   (c) Explain in short basic principle of working of stepper motor ? **4**
